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(88) **Date of publication of the international search report:**
8 March 2012

(54) **Title:** ELECTRODE ARRAY HAVING EMBEDDED ELECTRODES AND METHODS OF MAKING THE SAME

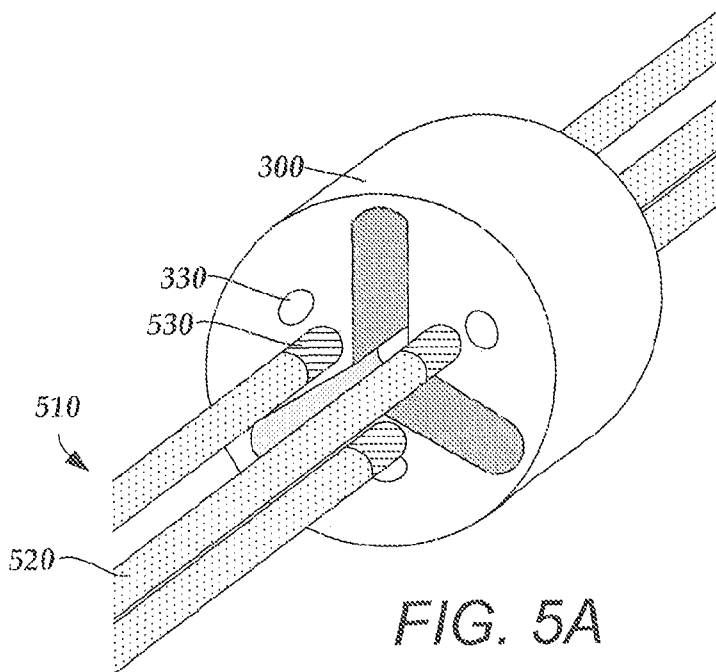


FIG. 5A

(57) **Abstract:** A method of manufacturing a device for brain stimulation includes forming a lead body having a distal end section and coupling at least one pre-electrode to the distal end section of the lead body. The pre-electrode defines a divider with a plurality of partitioning arms, and has a plurality of fixing lumens. A portion of the pre-electrode aligned with the partitioning arms is removed to divide the pre-electrode into a plurality of segmented electrodes. Each of the plurality of segmented electrodes defines at least one of the plurality of fixing lumens at least partially disposed through the segmented electrode. A material is introduced through the at least one fixing lumen to couple the plurality of segmented electrodes to the lead body.

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INTERNATIONAL SEARCH REPORT

International application No PCT/US2011/040229

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61N1/05
ADD. A61N1/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61N A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/168805 A1 (HEGLAND MICHAEL [US] ET AL) 3 August 2006 (2006-08-03) abstract; figures 8-17 -----	1-5
X,P	US 2011/005069 A1 (PIANCA ANNE MARGARET [US]) 13 January 2011 (2011-01-13) the whole document -----	1-5
X,P	US 2011/047795 A1 (TURNER KEVIN [US] ET AL) 3 March 2011 (2011-03-03) the whole document -----	1-5
A	US 2007/038279 A1 (FIFER DANIEL W [US] ET AL) 15 February 2007 (2007-02-15) the whole document -----	1-5
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2009/001327 A2 (FLIP TECHNOLOGIES LTD [IE]; O'DEA JOHN [IE]; MCHUGH ADRIAN [IE]; GRIFF) 31 December 2008 (2008-12-31) the whole document -----	1-5
A	US 2007/168007 A1 (KUZMA JANUSZ A [AU] ET AL) 19 July 2007 (2007-07-19) the whole document -----	1-5
A	WO 2010/055421 A1 (ALEVA NEUROTHERAPEUTICS S A [CH]; MERCANZINI ANDRE [CH]; RENAUD PHILIP) 20 May 2010 (2010-05-20) the whole document -----	1-5
A	WO 2010/060011 A2 (UNIV ST LOUIS [US]; MORAN DANIEL [US]; CHRISTIANSEN BLAINE [US]; MACEW) 27 May 2010 (2010-05-27) the whole document -----	1-5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/040229

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-5

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-5

Method of manufacturing a device for brain stimulation, the method comprising: forming a lead body, coupling a pre-electrode to the lead body (with the pre-electrode defining a divider with a plurality of partitioning arms), and removing a portion of the pre-electrode to divide the pre-electrode into a plurality of segmented electrodes;

2. claims: 6-13

Device for brain stimulation comprising: an insulative tubing, at least one electrode frame disposed on the insulative tubing (with each electrode frame defining at least one electrode cavity), and a plurality of segmented electrodes disposed within each of the electrode cavities;

3. claims: 14-17

Method of manufacturing a device for brain stimulation, the method comprising: forming an insulative carrier having a plurality of apertures, disposing a plurality of segmented electrodes within each of the apertures, and wrapping the insulative carrier around a mandrel to form a cylindrical lead body; and

4. claims: 18-20

Method of manufacturing a device for brain stimulation, the method comprising: forming an insulative tubing, forming at least one conductor lumen through the insulative tubing, introducing a plurality of electrode tubes through the conductor lumens, and removing a portion of the outer surface of the insulative tubing to expose a plurality of segmented electrodes.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2011/040229

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006168805	A1	03-08-2006	AT 448830 T 15-12-2009
			EP 1846092 A1 24-10-2007
			EP 1848496 A1 31-10-2007
			US 2006168805 A1 03-08-2006
			US 2006173262 A1 03-08-2006
			US 2011056076 A1 10-03-2011
			WO 2006083881 A1 10-08-2006
			WO 2006083884 A1 10-08-2006

US 2011005069	A1	13-01-2011	US 2011005069 A1 13-01-2011
			US 2011078900 A1 07-04-2011
			WO 2011005716 A2 13-01-2011

US 2011047795	A1	03-03-2011	US 2011047795 A1 03-03-2011
			WO 2011028809 A1 10-03-2011

US 2007038279	A1	15-02-2007	NONE

WO 2009001327	A2	31-12-2008	EP 2160218 A2 10-03-2010
			US 2010228202 A1 09-09-2010
			WO 2009001327 A2 31-12-2008

US 2007168007	A1	19-07-2007	US 7891085 B1 22-02-2011
			US 2007168007 A1 19-07-2007
			US 2011118815 A1 19-05-2011

WO 2010055421	A1	20-05-2010	CA 2743575 A1 20-05-2010
			EP 2382008 A1 02-11-2011
			US 2011301665 A1 08-12-2011
			WO 2010055421 A1 20-05-2010

WO 2010060011	A2	27-05-2010	US 2011251473 A1 13-10-2011
			WO 2010060011 A2 27-05-2010
